RIGHT-TO-CARRY CONCEALED WEAPON LAWS AND HOMICIDE IN LARGE U.S. COUNTIES: THE EFFECT ON WEAPON TYPES, VICTIM CHARACTERISTICS, AND VICTIM-OFFENDER RELATIONSHIPS*

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Abstract

Recently, a number of states have enacted laws that allow citizens to carry concealed weapons. This "natural experiment" was analyzed by John Lott and David Mustard, who found that these right-to-carry laws reduced violent crime, with a substitution toward property crimes, in those jurisdictions that adopted this law. Of particular importance, they found that homicide was reduced significantly, with even greater declines in larger jurisdictions. Their findings came at the same time that major reductions in homicide were occurring in many cities and states that did not change their gun-carrying policies, which lead to questions of whether their finding was spurious, caused by problems with the data or methods. In this paper, we describe an analysis that looks at the effect of changing one aspect of their homicide analysis: disaggregating homicide data by weapon type, victim characteristics, and victim-offender relationships. The results show that the liberalized carrying laws are associated with a number of effects, some that are consistent with those found by Lott and Mustard and others that are not. It also illustrates the importance of being able to look beyond aggregate crime measures in this type of examination, which is currently possible on a national level only for the crime of homicide.

I. Introduction

In recent years, there has been considerable attention focused on the issue of gun-related violence. Closely tied to this, homicides have also been of major concern recently in the United States, with regard to their commission

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by juveniles,[1] their frequency among intimate partners,[2] the enormous societal costs that these offenses impose,[3] and the prevalence of guns in their commission. Since 1988, more than one-half of all homicides committed in the United States have involved a firearm, and the proportion of homicides involving a firearm has increased.[4] Many have argued that it is the increased availability of firearms that has led to increased gun homicides,[5] that the use of guns in the commission of violent crimes increases the likelihood of injury and lethality,[6] or that decreased availability reduces homicide.[7] Although many of these positions seem intuitively obvious and have shaped arguments for increased control and restrictions on firearm availability and access, the overall prevalence of handgun use in the commission of all violent crimes is relatively low. A handgun was used in approximately 9 percent of all violent offenses.[8]

On the other hand, some have counterargued that when aggressors use guns, there is a lower likelihood of victim nonfatal injury, owing to increased compliance by crime victims, producing less of a need for an aggressor to carry out an attack to achieve the goals.[9] Similarly, John Lott and David Mustard concluded that allowing citizens to carry concealed handguns can reduce murder rates and other crimes of violence, through deterrence.[10] Specifically, Lott and Mustard found that in those states that passed laws allowing citizens to carry concealed weapons (referred to as "shall-issue" or "right-to-carry" laws throughout this paper), total homicides decreased 7 percent, with even greater decreases experienced among the largest counties.[11] The theory underlying this hypothesis—that allowing citizens to carry concealed

[1] James A. Fox, Trends in Juvenile Violence: A Report to the United States Attorney General on Current and Future Rates of Juvenile Offending (Working paper, Northeastern Univ. 1996).

[2] Lawrence A. Greenfeld *et al.*, Violence by Intimates: Analysis of Data on Crimes Committed by Current or Former Spouses, Boyfriends, and Girlfriends (1998).

[3] Ted R. Miller, Mark A. Cohen, & Brian Wiersema, Victim Costs and Consequences: A New Look (1996).

[4] Gary Kleck, Targeting Guns: Firearms and Their Control, table 1.2 (1997).

[5] For example, see Arthur L. Kellermann *et al.*, Gun Ownership as a Risk Factor for Homicide in the Home, 329 New Eng. J. Med. 1084 (1993); and Alfred Blumstein, Violence by Young People: Why the Deadly Nexus? 229 Nat'l Inst. Just. J. 2 (1995).

[6] Frank E. Zimring, The Medium Is the Message: The Firearm Caliber as a Determinant of Death from Assault, 1 J. Legal Stud. 97 (1972).

[7] For example, see Colin Loftin *et al.*, Effects of Restrictive Licensing of Handguns on Homicides and Suicide in the District of Columbia, 325 New Eng. J. Med. 1615 (1991); David McDowall, Colin Loftin, & Brian Wiersema, Comparative Study of the Preventive Effects of Mandatory Sentencing Laws for Gun Crimes, 83 J. Crim. L. & Criminology 378 (1992).

[8] See Kleck, *supra* note 4, at 6.

[9] See *id.* at 258.

[10] John R. Lott, Jr., More Guns, Less Crime: Understanding Crime and Gun Control Laws (1998); and John R. Lott, Jr., & David B. Mustard, Crime, Deterrence, and Right-to-Carry Concealed Handguns, 26 J. Legal Stud. 1 (1997).

[11] See Lott & Mustard, *supra* note 10, at 24–25.

weapons can reduce crimes against persons—is the belief that individuals can be deterred from engaging in particular behaviors if the cost (actual or perceived) is too high.

The rather extensive body of literature assessing the impact of deterrence on crime, which evolved during the late 1960s and early 1970s, has traditionally focused on the role punishment has in reducing crime levels and has included such measures as risk of arrest, conviction, or incarceration. The body of deterrence literature has also been frequently reviewed, critiqued, and utilized by public policy makers in their attempts to have a direct effect on crime levels.[12] However, deterrence is not the only policy that has been studied to explain changes in homicide rates. Indeed, competing hypotheses abound, since people concerned with the effect of other policies on homicide are also eager to analyze homicide data from different standpoints. For example, the decline of youth homicide in Boston has been attributed to a unique public-private approach,[13] and the decline in male-on-female intimate homicides (without a concomitant decrease in female-on-male intimate homicides) has been attributed to the provision of shelters as options for women faced with untenable marital situations.[14]

Still, it is fairly clear that deterrence works. However, the question is not so much whether executions, incarceration, and gun laws deter people from committing crime. Rather, the question is who is deterred, for what crimes, under what circumstances, to what extent, for whom, and at what cost. Policies have a tendency to be oversold by their proponents and undersold by their opponents, so careful scrutiny is not only desirable but important. This paper is an attempt to subject the policy recommendation explicitly proposed by Lott, which promoted the enactment of laws to permit citizens to carry concealed weapons, to such scrutiny. Indeed, there are good empirical reasons for doing so. Since the early 1990s, homicide rates have fallen dramatically in major cities in California, New York, Texas, and Florida, to name a few of the more populous states, without there having been any substantial change in their right-to-carry laws during this period.

[12] Alfred Blumstein, Jacqueline Cohen, & Daniel Nagin, Deterrence and Incapacitation: Estimating the Effects of Criminal Sanctions on Crime Rates (1978); Richard A. Wright, In Defense of Prisons (1994); and Daniel S. Nagin, Criminal Deterrence Research at the Outset of the Twenty-First Century, in Crime and Justice: An Annual Review of Research 51 (Michael Tonry ed. 1998).

[13] David M. Kennedy, Anne M. Piehl, & Anthony A. Braga, Youth Violence in Boston: Gun Markets, Serious Youth Offenders, and a Use-Reduction Strategy, 59 L. & Contemp. Probs. 147 (1996).

[14] Richard Rosenfeld, Changing Relationships between Men and Women and the Decline in Intimate Partner Homicide, in The Nature of Homicide: Trends and Changes: Proceedings of the 1996 Meeting of the Homicide Research Working Group (Pamela K. Lattimore & Cynthia A. Nahabedian eds. 1997).

II. The Impetus for the Current Study

The purpose of our study was to more closely examine the findings and conclusions reached by Lott and Mustard specifically with respect to the effect of laws requiring the issuance of permits to carry concealed handguns (right-to-carry laws) on homicide.[15] We have a number of reasons for this focus. First, a number of issues related to the overall quality of crime data, which in many instances Lott and Mustard were the first to identify and question, can be illustrated when considering homicide. Second, in contrast to the lack of detailed data regarding most crimes reported to the police in the United States, homicide is the only offense for which county-level information regarding the weapon, victim characteristics, and victim-offender relationships is available. As Lott and Mustard found, when total crimes were disaggregated into individual violent and property offenses, the effect of the right-to-carry law varied. Therefore, we were interested in examining the extent to which the right-to-carry law had different effects when we disaggregated homicides by weapon types and victim characteristics. Last, but certainly not the least important, is the fact that homicide imposes a substantial social, psychological, and financial burden on society at large, let alone on the victims and their families. Lott and Mustard estimated that the financial savings attributable to the reductions in crime resulting from the passage of the right-to-carry laws are more than $6 billion, with almost $4.3 billion of that coming from the reductions in homicide.[16]

Lott and Mustard were careful to recognize that there are significant problems with the data. But it turns out that the problems are greater than they were aware of at the time their research was conducted. The crime data published annually by the Federal Bureau of Investigation (FBI) Uniform Crime Reports (UCR) program[17] have many deficiencies that are only now being uncovered, including missing offense and arrest data and the imputation of missing county data.[18] Some of the reasons for missing data include lack of anything to report, problems with computer hardware, natural disasters, budgetary restrictions, personnel or training or software problems, or failure to follow UCR reporting guidelines. This is true even with homicide data, which are always assumed to be better than data for other crime categories.

Much of the research on deterrence focuses on homicide because it is considered the offense least open to under- or misreporting. Yet even the reliability of this crime data has its limitations. Although reporting of ag-

[15] See Lott & Mustard, *supra* note 10.

[16] See *id.* at 24–25.

[17] U.S. Dep't Just., Federal Bureau of Investigation, Crime in the United States (various years).

[18] For a detailed analysis of these deficiencies, see Michael D. Maltz, Bridging Gaps in Police Crime Data (Discussion Paper No. NCJ1176365, U.S. Dep't Justice, September 1999).

gregate homicide data has been relatively good, it varies considerably from state to state and jurisdiction to jurisdiction.[19] Lott and Mustard used state-level aggregates of homicide data from the FBI's Supplementary Homicide Reports (SHRs), but they were unable to use county-level data because the FBI does not use Federal Information Processing Standards (FIPS) codes for jurisdiction or county identifiers that would facilitate disaggregation. The National Archive of Criminal Justice Data (NACJD), in concert with Bureau of Justice Statistics, has been developing a crossover between FIPS codes and the FBI's identifiers,[20] and we were able to employ it to investigate additional aspects of the data. Still, the SHRs suffer from some of the same completeness issues mentioned above; in particular, the variation in information about offenders is considerable, with the most diligent county reporting information on about 95 percent of offenders and the least diligent reporting information on about 5 percent of offenders.[21] In addition, there are instances of spotty reporting: Florida's SHR data were not reported for 1989–92. However, despite these problems the SHRs provide a great deal of information about each offense and victim.

Patterns of homicide are complex, and although many researchers do not recognize it, these offenses involve a multitude of different motivations.[22] In fact, one can view homicide "not so much as a crime in itself as it is the fatal outcome of different crimes"[23]—the fatal outcome of domestic violence becomes domestic homicide, child abuse becomes infanticide, armed robbery becomes felony murder, and so on. For this reason, we felt it best not to focus on homicide in general but to look at different types of homicide and determine how different types vary with changes in right-to-carry laws.

Thus, there are many issues that need to be addressed to ascertain the validity of the Lott and Mustard's assertion of "more guns, less crime." Our approach in this study is not to deal with all of them at once but to start out in this study by looking at only one issue and by considering other issues in subsequent studies. In this paper, we investigate the extent to which disaggregating homicides by different types affects their findings.

[19] See note 17 *supra*.

[20] U.S. Dep't Just., Bureau of Just. Stat., Law Enforcement Agency Identifiers Crosswalk (1996).

[21] It, too, has its problems. One of us (Michael Maltz) is currently conducting a study looking at infanticide data, comparing SHR data on homicides of newborns (under 1 year of age) with homicide data collected by the National Center for Health Statistics. Our preliminary investigation, comparing the age, sex, and race of the victim and the year and jurisdiction of the incident, indicates that fewer than 30 percent of the infanticides are recorded in both data sets.

[22] Michael D. Maltz, Visualizing Homicide: A Research Note, 14 J. Quant. Criminology 397 (1998).

[23] Michael D. Maltz, Which Homicides Decreased? Why? 88 J. Crim. L. & Criminology 1479 (1999).

III. Data and Methods Used in the Current Study

A. Data Used in the Current Study

The original data file used by Lott and Mustard included detailed county-level variables related to crime and population, plus a dummy variable for jurisdictions with right-to-carry concealed weapon laws from 1977 through 1992.[24] With respect to the crime measures, the data included annual county-level UCR data on the number of Index offenses reported to the police, including murder, and the number of arrests for each Index offense. Combining the arrest and offense data, they calculated the "risk of arrest," or arrest rate.[25] The population data included the total number of residents per county per year, as well as detailed demographic characteristics of the population. For each county and year, the file contained "detailed information on the racial, age [and gender] breakdown of the county (percent of population by each racial group and by gender between 10 and 19 years of age, between 20 and 29, between 30 and 39, between 40 and 49, between 50 and 64, and 65 and over."[26] In addition, the population density per square mile, per capita income, per capita unemployment insurance payments, per capita income maintenance payments, and per capita retirement payments (all in real 1983

[24] We are thankful to Thomas Marvell for providing us with clarifications as to when the right-to-carry laws went into effect.

[25] The "risk of arrest" is essentially the number of arrests divided by the number of crimes. Yet, much like homicide itself, this variable covers a multitude of situations. In intimate partner homicides or infanticides, for example, the true risk of arrest for homicide is very high, since the offender is usually known; in other types, the risk is much lower. Aggregating these very different situations into one catchall, and then labeling it "risk," is fraught with problems, despite the popularity of the practice among those studying deterrence (Michael D. Maltz, Operations Research in Studying Crime and Justice: Its History and Accomplishments, in Operations Research and the Public Sector 233 (Stephen M. Pollack, A. Barnett, & M. H. Rothkopf eds. 1994)). While it may be more appropriate to calculate risk of arrest for each specific type of homicide (for example, gun homicides versus nongun, known offender versus stranger, and so on), because of the way UCR and SHR data are collected, this detail is not available. In addition, arrest data have even more problems than the offense data described earlier. Reporting is less reliable, especially in smaller counties. Whereas crime reports in 1997 were recorded for jurisdictions that cover about 87 percent of the U.S. population, the corresponding coverage figure for arrests is 68 percent; the state-to-state variation in 1997 ran from 100 percent (five states) to 0 percent (four states). Another major problem with arrest data is the manner in which they are tabulated. Because of publication deadlines that are more easily met by urban jurisdictions, there is an urban bias to the compiled arrest data (Howard N. Snyder, The Over-representation of Juvenile Crime Proportions in Robbery Clearance Statistics, 15 J. Quant. Criminology 151 (1999)). Moreover, there are some counties that, according to Lott's data, produce risk-of-arrest rates (that is, number of arrests divided by number of homicides) of over 100 percent. Whether this is due to many arrests for the same homicide, or because arrests were made for homicides committed in earlier years, or for some other reason, we have not been able to determine at this time. In any event, it serves to underscore the problem of using counties with such small numbers of homicides that stochastic variation needs to be considered.

[26] See Lott & Mustard, *supra* note 10, at 15.

dollars) were included. Finally, a dummy variable indicating if and when a county operated under a "shall-issue" right-to-carry law was included, with a value of one indicating the presence of the law.[27]

We modified the original file by first selecting only those counties with a 1977 population of 100,000 or more residents. This reduced the size of the sample from the original 3,054 counties to 477 counties. There were three primary reasons for selecting only large counties. The first was the previous finding by Lott and Mustard that homicides decreased more in larger jurisdictions as a result of the right-to-carry law. For example, when Lott examined the effect of the law across jurisdictions of different sizes, he found that the law appeared to reduce crime more in larger jurisdictions than smaller ones and concluded that "the new laws induce the greatest changes in the largest counties."[28] Similarly, Lott and Mustard detected a 9 percent reduction in homicides in counties with a population of 100,000 or more, compared to a 7.6 percent reduction across all jurisdictions.[29] Second, since we were looking specifically at murder offenses, which tend to occur infrequently in most jurisdictions, we wanted to ensure that there would be a sufficient number of homicides to allow for the analyses of the subcategories we intended to examine. Indeed, in order to examine the changes in the proportion of homicide victims accounted for by males versus females, whites versus nonwhites, or known versus stranger victim-offender relationships, only jurisdictions with homicides can be examined. However, even with this population restriction introduced, there were still 149 county/year observation points (2.3 percent) included in the sample with no homicides recorded and almost one-quarter (24.6 percent) with fewer than five homicides. Across all the counties included in the analyses, the average number of homicides per county per year was 38 (Table 1).

Given this relatively low number of homicides occurring across the counties included in the analyses, the concern raised by Arnold Barnett regarding the examination of homicides in the deterrence literature needs to be noted.[30] Like any other statistic, the homicide rate has a certain natural (or stochastic) variation. Barnett showed the importance of taking it into consideration. Specifically, he assumed that each person i in a jurisdiction has a nonzero probability p_{ij} of committing j homicides in a given year. The expected number of homicides for person i is simply

$$E(h_i) = h_i = \sum_j j p_{ij},$$

[27] For a more detailed description of the variables, their sources, and computations, see *id*.

[28] See Lott, *supra* note 10, at 63.

[29] See Lott & Mustard, *supra* note 10, at 19 & 49.

[30] Arnold Barnett, The Deterrent Effect of Capital Punishment: A Test of Some Recent Studies, 29 Operations Res. 346 (1981).

TABLE 1

SUMMARY OF SPECIFIC VARIABLES INCLUDED IN THE ANALYSES (Annual Measures)

Variables	Mean	Median	SD
County population[a]	376,012	216,032	561,045
County population density (population per square mile)[a]	982.6	342.3	3,050.5
Percent of county population African-American[a] (%)	10.5	6.8	11.4
County per-capita income[a] ($)	13,097	12,541	2,839
Right-to-carry law adopted dummy[a]	.14	.0	.35
County murder arrest rates (ratio of arrests to offenses)[a] (%)	97.5	88.9	74.3
Total number of murders (SHR)[a]	38.1	11.0	128.1
Total number of murders committed with a firearm (SHR)[a]	23.4	6.0	84.8
Percent of murders committed with a firearm (SHR)[a] (%)	55.1	57.1	24.3
SHR murder rate per 100,000 population[a]	7.2	5.0	8.5
Percent of murder victims male[a] (%)	68.3	71.4	21.5
Percent of firearm murder victims male[b] (%)	74.5	80.0	24.5
Percent of murder victims white[a] (%)	66.2	66.7	27.3
Percent of firearm murder victims white[b] (%)	63.6	66.6	31.0
Percent murder victims known to offender (family plus acquaintance)[a] (%)	62.9	63.4	23.3
Percent SHR gun victims known (family plus nonfamily)[b] (%)	65.5	66.6	27.2
Percent SHR gun victims strangers[b] (%)	19.5	13.7	22.9
Percent SHR gun victims relationship unknown[b] (%)	15.0	10.5	19.1

NOTE.—SHR: Supplementary Homicide Reports.
[a] $N = 6{,}425$.
[b] $N = 6{,}008$.

and for the jurisdiction,

$$E(H) = NE(h_i).$$

On the basis of this and reasonable assumptions about the data, he goes on to show that the expected number of homicides in a jurisdiction will have a variance close to its expectation; that is,

$$\sigma^2(H) = 1.04E(H).$$

Thus, for a county that experiences 25 homicides in a year, about two-thirds of the time we can expect a year-to-year natural variation of about five homicides (and 95 percent of the time the number will run between 15 and 35).

Another reason to limit the analyses to only the larger counties is to mitigate the problem associated with low numbers of murder arrests and offenses (especially when homicides are parsed by weapon type, victim characteristics, and relationship), which, when combined to calculate the risk of arrest, can produce results that are difficult to interpret. With low numbers of arrests

and/or offenses, often the risk of arrest either cannot be calculated (because of a zero in the denominator and a value of one or more in the numerator), or it exceeds 100 percent. Although Dan Black and Daniel Nagin[31] have commented on and assessed the effect on Lott and Mustard's results when observations were excluded because of missing risk-of-arrest measures (for example, instances where there were murder arrests but no offenses), concern regarding risk-of-arrest measures in excess of 100 percent has not been raised. By limiting the analyses to only relatively larger jurisdictions, the frequency of these problems is reduced somewhat, although for some observation points, there were still counties with missing risk-of-arrest values or rates of arrest exceeding 100 percent.[32]

After selecting only those counties with a 1977 population of 100,000 or more, we then added to the data a number of new variables measuring homicides, and the characteristics of the offenses and victims, for each county and year observation. Using SHR data, we calculated the following new variables for each county included in the sample:

1. total SHR homicides,
2. total SHR homicides committed with a firearm,[33] and
3. total SHR homicides committed without a firearm.[34]

From these figures, we then used the total county population to calculate the murder rate per 100,000 residents and then transformed these rates into their natural logs. In those instances in which there were no homicides reported, .1 was added before the calculation of the crime rate and log transformation. With these new measures of SHR homicide, we were able to compare our results to those produced by Lott and Mustard using UCR and Mortality Detail Records data.[35]

In addition to calculating total, firearm, and nonfirearm murder rates using

[31] Dan A. Black & Daniel S. Nagin, Do Right-to-Carry Laws Deter Violent Crime? 27 J. Legal Stud. 209 (1998).

[32] In the data provided by Lott and Mustard, we found that roughly one-third of the observations had a risk-of-arrest measure exceeding 100 percent, and 5 percent of the observations had a risk of arrest in excess of 200 percent. There are a number of unique circumstances when dealing with race crimes, such as homicide, which result in these risks of arrest exceeding 100 percent. For example, an arrest may be made for a murder occurring in a prior year, or multiple offenders could be arrested for a single offense. These problems are most likely to occur in relatively smaller jurisdictions, or at least ones with few homicides, and jurisdictions were weighted by their population, so the influence of these outliers on the results should be minimal.

[33] Although the SHR weapon variable included separate codes for different types of firearms (for example, handguns, shotguns, and rifles), some cases (7.5 percent) involving a firearm were categorized in the SHR as just "firearm" or "other gun."

[34] To arrive at the number of nonfirearm homicides we subtracted the number of firearm homicides from the total SHR homicides. Included in this figure was a small number of offenses for which the weapon was either not known or not reported.

[35] U.S. Dep't Health & Human Serv., Mortality Detail Files (various years).

the SHR data, we also developed variables that measure the distribution of homicide victim characteristics across total, nonfirearm, and firearm homicides. Specifically, we calculated the following distributions of homicide victim characteristics from the SHR data:

1. Percent of total, nonfirearm, and firearm homicide victims who were (*a*) male or female, (*b*) white or nonwhite, and (*c*) within specific age ranges.
2. Percent of total, nonfirearm, and firearm homicide victims (*a*) who were known to the offender (for example, family member or other acquaintance), (*b*) who were a stranger to the offender, and (*c*) where the victim-offender relationship could not be determined.

For each of these new SHR homicide variables, we also calculated the 1-year lags. These SHR data were then merged with the original Lott and Mustard file, matching on the county identification number (FIPS code) and the year. A cross-walk, now available from NACJD, allowed for the matching of FIPS codes and the Originating Agency codes used to identify the law enforcement agencies reporting SHR data.[36] This cross-walk was developed recently and was not available when Lott and Mustard attempted to generate county-level SHR data.

Although Lott and Mustard reported a correlation between the state-level UCR murder rate and the SHR murder rate of less than .7,[37] we found the county-level correlation, for large counties, between these two measures to be slightly higher ($r = .83$). Thus, there are some differences between the number of murders reported through the UCR and SHR and, as a result, differences in the murder rates resulting from these two sources. Although some of the differences between the UCR and SHR rates were relatively large, for most observations (93.4 percent), the differences between the SHR and UCR murder figures were fewer than six homicides.[38] Some potential reasons for these differences include the following:

1. the failure of a law enforcement agency to submit SHR data when a homicide is recorded in UCR data, which would result in UCR murder being higher than SHR murder;
2. a UCR report filed for an assault/battery in which the victim later dies, resulting in the submission of SHR data but no change made to original

[36] See U.S. Dep't Just., *supra* note 20.

[37] See Lott & Mustard, *supra* note 10, at 49.

[38] Across all of the observation points for the jurisdictions with a population of 100,000 or more, in 62 percent of the cases the number of murders reported through the SHR and UCR were exactly the same. In 26.4 percent of the cases the SHR figure was lower than the UCR figure, whereas 11.6 percent of the cases revealed higher SHR murder numbers than what was recorded in the UCR. The average difference between SHR and UCR murders was higher in those cases where the SHR murders exceeded the murders reported through the UCR.

assault/battery UCR report, which would result in the number of SHR murders being higher than the number of UCR murders; and

3. submission of SHR data by an agency under the belief that this also satisfies UCR reporting, which would also result in the number of SHR murders being higher than the number of UCR murders.

Summarized in Table 1 are the number of cases and the mean, median, and standard deviations for some of the previous variables used by Lott and Mustard within our sample of large counties and those we developed from the SHR data. As can be seen, the populations of the counties included in our analyses are relatively large, with an average population of more than 376,000 residents and a median population of more than 216,000. Population density is also illustrative of how urban many of the counties are, with an average of 982 people per square mile, although the median population density was much lower, at 342 residents per square mile. Although population density is a popular measure of the urbanization of an area, there are other measures of urbanicity that could have been used.[39] Across all the counties included in the analyses, a relatively small proportion of the total population was African-American, accounting for an average of only 10.5 percent of each county's total population. As would be expected, the average number of murders and the average murder rate was low relative to other types of crime. On average, 38 murders were committed per year per county, which translates to an average homicide rate of 7.2 murders per 100,000 residents. On average, a firearm was used in 55 percent of all large-county homicides during the period of study. Of those homicides committed with a firearm, an average of 74 percent of victims were male and 63 percent were white. A relatively large percentage (almost two-thirds) of gun-homicide victims knew their killer, as either a family member or other acquaintance, whereas only about 20 percent of gun-homicide offenders were categorized as "strangers"; in an additional 15 percent of the gun murders the victim-offender relationship was unknown or unreported.

B. Methods Used in the Current Study

Our examination of the relationship between the right-to-carry concealed weapon laws and levels of murder employed the same statistical methodology (cross-sectional time-series or pooled time-series analysis) and included the same exogenous variables (with one exception noted below) in the regression models as used by Lott and Mustard. As in Lott and Mustard's analyses, we used weighted ordinary least squares regression, with the weight being the county population. Included in all of the regressions was a dummy variable for the shall-issue law (right to carry concealed weapons), the "risk of arrest"

[39] Colin R. Goodall, Karen Kafadar, & John W. Tukey, Computing and Using Rural versus Urban Measures in Statistical Applications, 552 Am. Stat. 101 (1998).

for murder,[40] a 1-year lag of the dependent variable,[41] county population, county population density, measures of county resident income and unemployment, and detailed information on the racial, age, and gender distribution of the population.[42] One aspect of our models was different from those of Lott and Mustard: whereas they included the lagged total homicide rate as an exogenous variable in each of their equations, we developed separate lagged measures specifically for each of the endogenous variables and included these as exogenous variables.

IV. Results

A. Right-to-Carry Concealed Handguns and Total Homicide Rates

Using the same model as Lott and Mustard, we first attempted to replicate their findings regarding the effect of right-to-carry laws on total SHR homicide rates for our sample of counties with populations over 100,000 residents (Table 2, model 1). For the regression analyses, the dependent variable (total SHR murder rate) was converted to a natural log. (Recall that if the true rate equaled zero, we added .1 before we took the natural log.) Our results indicated that the direction of effect of the shall-issue law on total SHR homicide rates was similar to that obtained by Lott and Mustard, although the magnitude of the effect was somewhat smaller and was statistically significant at the 7 percent level. In our analysis, which included only counties with a 1977 population of 100,000 or more, laws allowing for concealed weapons were associated with a 6.52 percent reduction in total homicides (Table 2). By comparison, Lott and Mustard found the concealed weapon dummy variable to be associated with a 7.65 percent reduction in total homicides across all counties and a 9 percent reduction in homicides when only large counties (populations of 100,000 or more) were included.[43] Possible explanations for these differences between our large-county results and those reported by Lott

[40] Despite the fact that we examined different types of homicide, we included the total murder arrest rate (arrests/offenses) among the exogenous variables since data are not available that would have allowed us to calculate arrest rates for specific types of homicide (for example, arrests for firearm murder/total firearm murder offenses). While it would have been desirable to use a more offense-specific arrest rate, this is not currently possible in deterrence assessments that rely on national data collected through either the SHR or UCR programs.

[41] The inclusion of the lagged dependent variable addressed potential serial correlation in the time-series component of the analyses. In our analyses, we calculated the lag separately for each dependent variable and included it in the regression equations. In Lott and Mustard's analyses, the lagged total murder offense rate was used in all the equations.

[42] Although not presented in tabular form, in all of the regressions we included all of the variables used by Lott & Mustard, *supra* note 10, including a right-to-carry dummy variable, murder arrest rate, population density, population, per capita personal income, per capita unemployment insurance payments, per capita income maintenance payments, per capita retirement payments to persons over 65, percent of population within a specific age range, race and gender groups, county dummy variables, and year dummy variables.

[43] See Lott & Mustard, *supra* note 10, at 19 & 49.

and Mustard may relate to differences in how the counties were selected and also the fact that in our analyses the time period was 1977–92, whereas Lott and Mustard's covered the period 1982–92. Also, as was described earlier, there were differences between the SHR and UCR data in terms of the total number of murders. Given the relatively low frequency of homicides in many of the counties, the slight difference between these two data sets could produce relatively large differences in rates. Still, our analyses found that the right-to-carry laws were associated with a decrease in total homicides. We also examined the trends in total homicides before and after the right-to-carry law by substituting pre- and postlaw trends for the right-to-carry dummy variable. Doing so revealed a positive trend in homicides prior to the passage of the law and a decreasing trend following the passage of the law, although neither coefficient was statistically significant at the 10 percent level and the coefficients for the two trends were not statistically different from one another ($F = 1.74$, $p = .19$).

B. Right-to-Carry Concealed Handguns and Firearm/Nonfirearm Homicide Rates

The next set of analyses examined the association between the right-to-carry law and homicides committed with and without firearms. Because the UCR murder data do not specify the type of weapon used, only through use of the SHR data were we able to assess the association between the right-to-carry law and these different types of homicide. As with the prior analyses, both dependent variables (SHR nonfirearm murder and SHR firearm murder rates) were converted to natural logs, with .1 being added prior to calculating the rate and the natural log being taken if the true number equaled zero. Although Lott and Mustard did examine firearm and nonfirearm murder rates in counties with populations of 100,000 or more, they relied on Mortality Detail Records for 1982–91 county-level total gun death data. They then took these figures on gun deaths and subtracted them from the total number of murders reported through the UCR to determine the number of nonfirearm murders. When examining these data, Lott and Mustard found that the shall-issue law was associated with decreases in both gun and nongun murders (9 percent and 8.8 percent, respectively) in counties with populations of 100,000 or more, and they concluded that "carrying concealed handguns appears to make all types of murders less attractive."[44]

Using the county-level SHR data rather than Mortality Detail Records, we sought to replicate Lott and Mustard's analyses using SHR data for a longer period of time (1977–92, as opposed to 1982–91). When we ran the same regression equation used to examine the effect of the law on total homicides but substituted the SHR firearm murder rates as the dependent variable (Table

[44] See *id.* at 49.

TABLE 2

SHR Murder Results in Counties with Populations of 100,000 or More: County-Level Data for 1977–92

Exogenous Variables	Endogenous Variables (Natural Logs of the Murder Rate per 100,000, by Weapon)		
	ln(Total SHR Murder Rate) (Model 1)	ln(Gun SHR Murder Rate) (Model 2)	ln(Nongun SHR Murder Rate) (Model 3)
Right-to-carry law (dummy)	−.0652	−.209	.0975
	(1.80)	(3.49)	(1.63)
Murder arrest rate	−.00121	−.00153	−.00110
	(13.47)	(10.30)	(7.40)
Population per square mile	−.000006	−.000008	.000017
	(.11)	(.08)	(.17)
Real per-capita income:			
Personal income	.000006	.000006	.000002
	(.65)	(.39)	(.10)
Unemployment insurance	−.00042	−.00066	−.00004
	(2.38)	(2.27)	(.12)
Income maintenance	.000055	−.000026	.000082
	(.20)	(.06)	(.18)
Retirement payments per population over 65	−.000025	−.000022	−.000026
	(3.26)	(1.78)	(2.08)
Population	−.00000018	−.00000070	−.00000048
	(2.90)	(.69)	(4.62)
Race and age (percent of population):			
Black male:			
10–19	.127	−.215	.342
	(.46)	(.47)	(.75)
20–29	.271	.273	.397
	(2.06)	(1.26)	(1.84)
30–39	.234	.162	−.089
	(1.22)	(.51)	(.28)
40–49	−.995	−1.47	−.834
	(2.72)	(2.43)	(1.37)
50–64	−.546	−.517	−.299
	(1.53)	(.88)	(.51)
Over 65	.368	.264	.967
	(.76)	(.33)	(1.20)
Black female:			
10–19	.124	.375	−.041
	(.45)	(.82)	(.09)
20–29	−.622	−.778	−.502
	(4.28)	(3.24)	(2.08)
30–39	.066	.103	.609
	(.418)	(.40)	(2.33)
40–49	1.044	1.314	.752
	(3.52)	(2.68)	(1.53)
50–64	.555	.501	.401
	(1.78)	(2.68)	(.77)
Over 65	−.249	−.142	−.848
	(.78)	(.27)	(1.60)
White male:			
10–19	.00192	−.109	.0182
	(.02)	(.75)	(.13)
20–29	.0601	.0618	.0876
	(1.23)	(.77)	(1.08)
30–39	.0672	.132	−.056
	(.79)	(.94)	(.40)
40–49	−.211	−.278	−.001
	(1.87)	(1.49)	(.01)

50–64	−.0883	−.189	.0732
	(.81)	(1.04)	(.40)
Over 65	.0857	.137	−.00348
	(.87)	(.84)	(.02)
White female:			
10–19	.0289	.0637	.083
	(.31)	(.42)	(.54)
20–29	.00012	−.117	.089
	(.00)	(1.22)	(.92)
30–39	.0242	−.182	.283
	(.27)	(1.23)	(1.91)
40–49	.228	.200	.149
	(2.06)	(1.09)	(.81)
50–64	.0518	.0199	.086
	(.58)	(.13)	(.58)
Over 65	−.191	−.286	−.076
	(2.89)	(2.62)	(.70)
Other male:			
10–19	3.225	3.736	3.704
	(5.15)	(3.60)	(3.56)
20–29	.463	.132	1.115
	(1.01)	(.17)	(1.46)
30–39	−.200	−.150	−.196
	(.36)	(.16)	(.21)
40–49	−1.117	−1.899	−1.232
	(1.72)	(1.78)	(1.15)
50–64	−.915	−1.871	−.645
	(1.39)	(1.71)	(.59)
Over 65	.327	−.662	1.684
	(.47)	(.58)	(1.47)
Other female:			
10–19	−2.72	−3.422	−2.728
	(4.08)	(3.10)	(2.47)
20–29	−.789	−.320	−1.674
	(1.65)	(.40)	(2.11)
30–39	−.641	−1.065	−.0863
	(1.21)	(1.22)	(.10)
40–49	1.264	2.061	1.347
	(2.19)	(2.16)	(1.40)
50–64	1.61	2.189	1.251
	(2.53)	(2.07)	(1.18)
Over 65	−.181	.411	−1.092
	(.38)	(.53)	(1.39)
Intercept	1.423	5.707	4.946
	(1.03)	(2.50)	(2.16)
F-statistic	74.6	42.0	23.8
Adjusted R^2	.860	.773	.655

NOTE.—SHR: Supplementary Homicide Reports. The absolute *t*-statistics are in parentheses. $N = 6{,}420$. The same exogenous variables used by John R. Lott, Jr., & David B. Mustard, Crime, Deterrence, and Right-to-Carry Concealed Handguns, 26 J. Legal Stud. 1 (1997), table 3, are included in the analyses, except that the lagged murder rate is specific to total, nonfirearm, and firearm homicides, whereas Lott and Mustard used the total lagged murder rate for all analyses. All regressions use weighting, where the weighting is each county's population. Coefficients for county and year dummies are not presented.

2, model 2), the coefficient for the right-to-carry law dummy variable indicated a relatively large reduction (20.9 percent) in gun homicides, considerably larger than that found by Lott and Mustard. We also examined the trends in gun homicides before and after the right-to-carry law by substituting pre- and postlaw trends for the right-to-carry dummy variable. Doing so revealed a positive trend in gun homicides prior to the passage of the law and a decreasing trend following the passage of the law. The prelaw trend was not statistically

significant at the 10 percent level, but the negative postlaw trend was significant at the 1 percent level. Also, the coefficients for the pre- and postlaw trends were statistically different from one another ($F = 5.42$, $p = .05$).

On the other hand, when we substituted the natural log of the SHR nonfirearm murder rate as the dependent variable and included the lagged nonfirearm rate as an exogenous variable (Table 2, model 3), we found that the right-to-carry law was associated with a 9.75 percent increase in nonfirearm homicides, which was not quite statistically significant at the 10 percent level ($p = .103$), compared to the 8.8 percent reduction found by Lott and Mustard.[45] When the trends in nongun homicides before and after the right-to-carry law were examined, by substituting pre- and postlaw trends for the right-to-carry dummy variable, the coefficients indicated a negative, but not statistically significant at the 10 percent level, prelaw trend in nongun homicides and a positive, and statistically significant at the 5 percent level, postlaw trend. Also, the coefficients for the pre- and postlaw trends were statistically different from one another ($F = 3.74$, $p = .05$).

Thus, our results using the SHR data appear to be different from those produced through Lott and Mustard's analyses in a number of ways. Some of these differences were slight, others more dramatic. First, we found that the effect of the right-to-carry law on total homicides was slightly lower than that found by Lott and Mustard, although still in the direction that would suggest the law had a deterrent effect. The differences in the magnitude of effect may be explained by the different counties selected, the different time period, and/or the different data source for measures of homicide. However, our results regarding the effect of the right-to-carry laws on firearm versus nonfirearm homicides were considerably different than those found by Lott and Mustard. With respect to firearm homicides, the coefficient in our equation (model 2) indicates that the law was associated with a much larger decrease than that originally found by Lott and Mustard. On the other hand, the coefficient from our examination of the law's effect on nonfirearm homicide rates (model 3) indicates an increase in these homicides, whereas Lott and Mustard found a decrease. Again, one possible reason for the differences in our results may be due to differences in county selection and the number of years included in the analyses. It is also possible that Lott and Mustard's combination of the Mortality Detail Records from the National Center for Health Statistics and the UCR from the FBI produced different measures of the firearm and nonfirearm homicide rates. Given the relatively low frequency of homicides in many of the counties, slight differences between these two agency data sets could produce relatively large differences in rates. Another factor that could have contributed to the differences in our results versus those of Lott and Mustard was the fact that in our models we included the lagged firearm (model 2) and the lagged nonfirearm (model 3) murder rates,

[45] See *id.* at 49.

whereas Lott and Mustard used the total homicide rate as the lag in both their nonfirearm and firearm murder models.

C. Right-to-Carry Concealed Handguns and the Characteristics of Firearm and Nonfirearm Homicide Victims

Lott and Mustard also examined the effect concealed weapon laws had on determining which types of people were more or less likely to be murdered.[46] Using state-level SHR data, Lott and Mustard examined the effect of the law on the distribution of various victim characteristics across total homicides, including gender, race, and victim-offender relationship. Although they recognize the problems associated with relying on state-level data—specifically, the failure to account for the heterogeneity within states, because of the difficulty of generating county-level SHR figures prior to the availability of the cross-walk file described earlier—they were limited to using only the state aggregate data. In Lott and Mustard's analyses, no statistically significant changes in the distribution of victim gender, race, or relationship to the offender were found as a result of the concealed handgun law, but the signs of the coefficients indicated that there was a slight shift across victim-offender relationships. They interpreted this shift, away from homicides in which the victim-offender relationship was a stranger toward situations where the victim and offender were acquaintances, as a substitution effect: the possibility that concealed handgun laws cause criminals to substitute into crimes against those whom they know and presumably are also more likely to know whether or not they carry concealed weapons.[47]

However, Lott and Mustard examined the distribution of victim characteristics across total homicides, and as was seen previously (Table 2), it appears from our analyses that firearm homicides were impacted differently by the law than were nonfirearm homicides. Because of these differences in how the level of gun versus nongun offenses changed as a result of the right-to-carry law, we looked at the effect of the law on victim characteristics separately for total, firearm, and nonfirearm homicides. To do so, we selected as the endogenous variables the percentage of total, gun, and nongun homicide victims accounted for by either males or females and whites or nonwhites, as well as the percentage accounted for by those known to the victim (for example, family members plus other acquaintances), those who were strangers, or those in the category of "relationship unknown." In each of the analyses we used the same regression model and exogenous variables as in models 1–3 (Table 2). In all of these analyses, we also included the 1-year lag of the dependent variable.

When the gender distribution of total homicide victims (Table 3, models 4 and 5) and firearm homicide victims (Table 3, models 6 and 7) was ex-

[46] See *id.* at 48–51.

[47] See *id.* at 50–51.

TABLE 3

CHANGES IN THE GENDER COMPOSITION OF SHR MURDER VICTIMS IN COUNTIES WITH POPULATIONS OF 100,000 OR MORE: COUNTY-LEVEL DATA FOR 1977–92

	ENDOGENOUS VARIABLES (in Percentage Points)					
	Total Murders (N = 6,271)		Firearm Murders (N = 5,638)		Nonfirearm Murders (N = 5,483)	
EXOGENOUS VARIABLES	Male (Model 4)	Female (Model 5)	Male (Model 6)	Female (Model 7)	Male (Model 8)	Female (Model 4)
Right-to-carry law adopted dummy	−1.89	1.89	−4.00	4.00	−.605	.605
	(1.40)	(1.40)	(2.35)	(2.35)	(.31)	(.31)
Murder arrest rate	.0171	−.0171	.0156	.0156	.0134	.0134
	(5.08)	(5.08)	(3.55)	(3.55)	(2.60)	(2.60)
F-statistic	4.8	4.8	3.2	3.2	2.3	2.3
Adjusted R^2	.24	.24	.17	.17	.11	.11

NOTE.—SHR: Supplementary Homicide Reports. The absolute t-statistics are in parentheses. While not all of the coefficients are reported, the same exogenous variables used by John R. Lott, Jr., & David B. Mustard, Crime, Deterrence, and Right-to-Carry Concealed Handguns, 26 J. Legal Stud. 1 (1997), table 3, are included in the analyses, except that the lagged dependent variable is specific to the proportion of total, nonfirearm, and firearm homicides involving males and females, whereas Lott and Mustard used the total lagged murder rate for all analyses. In addition, all regressions use weighting, where the weighting is each county's population.

amined at the county level, a number of patterns associated with right-to-carry laws were identified that were different from those found by Lott and Mustard. Specifically, the coefficients indicate that the right-to-carry dummy variable was associated with a slight decrease in the proportion of total homicide victims accounted for by males (model 4) and a slight increase in the proportion of total homicides accounted for by females (model 5), although neither of these changes was statistically significant. However, when the gender distribution of firearm homicides was examined, the law appeared to have larger effects, which were statistically significant at the 1 percent level. Specifically, the law was associated with a decrease in the percent of firearm homicides accounted for by male victims—down 4 percent (model 6)—and an increase in the percent of firearm homicides accounted for by female victims—up 4 percent (model 7). This is not to say, however, that the number of female gun homicide victims increased as a result of the law. Indeed, the number of both male and female gun homicide victims decreased, but male victimizations decreased more than those experienced by females. These differences in the effect of the law across male and female victims may reflect some degree of substitution among criminals. On the basis of the examination of state-specific data, Lott found that women accounted for relatively small proportions of those with concealed weapon permits.[48] Thus,

[48] Lott, *supra* note 10, at 62.

TABLE 4

CHANGES IN THE RACIAL COMPOSITION OF SHR MURDER VICTIMS IN COUNTIES WITH POPULATIONS OF 100,000 OR MORE: COUNTY-LEVEL DATA FOR 1977–92

	ENDOGENOUS VARIABLES (in Percentage Points)			
	Total Murders (N = 6,271)		Firearm Murders (N = 5,638)	
EXOGENOUS VARIABLES	White (Model 10)	Nonwhite (Model 11)	White (Model 12)	Nonwhite (Model 13)
Right-to-carry law adopted dummy	1.52	− 1.52	.63	−.63
	(1.26)	(1.26)	(.38)	(.38)
Murder arrest rate	−.0068	.0068	−.0064	.0064
	(2.23)	(2.23)	(1.51)	(1.51)
F-statistic	35.8	35.8	22.8	22.8
Adjusted R^2	.75	.75	.69	.69

NOTE.—SHR: Supplementary Homicide Reports. Absolute t-statistics are in parentheses. While not all of the coefficients are reported, the same exogenous variables used by John R. Lott, Jr., & David B. Mustard, Crime, Deterrence, and Right-to-Carry Concealed Handguns, 26 J. Legal Stud. 1 (1997), table 3, are included in the analyses, except that the lagged dependent variable is specific to the proportion of total, nonfirearm, and firearm homicides involving whites and nonwhites, whereas Lott and Mustard used the total lagged murder rate for all analyses. In addition, all regressions use weighting, where the weighting is each county's population.

offenders in jurisdictions with laws allowing for concealed handguns may avoid potential male victims owing to their higher likelihood of being armed. When similar analyses were performed to examine the effect on the gender distribution of nonfirearm homicides (models 8 and 9), the directions of the coefficients were similar to the two prior analyses, but the magnitude of the coefficients were much smaller and were not statistically significant. Although Lott and Mustard's state-level SHR analyses of total homicides did not yield any statistically significant results when gender was examined, the sign of the shall-issue coefficients in their gender distribution analysis was the opposite of ours (positive for males, negative for females).

In terms of the effect of the law on the racial distribution of total and firearm-specific homicide victims (Table 4, models 10–13), our analyses found that the law resulted in a slight, albeit not statistically significant, increase in the proportion of firearm homicide victims accounted for by whites and a slight decrease in the proportion of victims who were nonwhite. Similarly, using state-level SHR data for the same period and with the same exogenous variables and statistical method, Lott and Mustard found that the law had no effect on the racial distribution of total homicides.[49] With respect to the age distribution of gun homicide victims (not presented in tabular form), we found no statistically significant changes associated with the right-to-carry law, although the signs of the coefficients indicated a slight reduction

[49] Lott & Mustard, *supra* note 10, at 49.

TABLE 5

CHANGES IN THE VICTIM-OFFENDER RELATIONSHIP COMPOSITION OF SHR MURDER VICTIMS IN COUNTIES WITH POPULATIONS OF 100,000 OR MORE: COUNTY-LEVEL DATA FOR 1977–92

	ENDOGENOUS VARIABLES (in Percentage Points)					
	Total Murders (N = 6,271)			Firearm Murders (N = 5,638)		
EXOGENOUS VARIABLES	Known (Model 14)	Stranger (Model 15)	Unknown/ Missing (Model 146)	Known (Model 17)	Stranger (Model 18)	Unknown/ Missing (Model 19)
Right-to-carry law adopted dummy	1.46	−2.89	1.34	3.10	−4.31	1.14
	(.96)	(2.04)	(1.20)	(1.57)	(2.46)	(.76)
Murder arrest rate	.01897	−.0292	.0111	.01198	−.0236	.01194
	(4.98)	(8.26)	(3.98)	(2.34)	(5.21)	(3.08)
F-statistic	7.3	9.1	2.8	6.0	7.4	2.1
Adjusted R^2	.35	.41	.14	.32	.37	.10

NOTE.—SHR: Supplementary Homicide Reports. Absolute t-statistics are in parentheses. While not all of the coefficients are reported, the same exogenous variables used by John R. Lott, Jr., & David B. Mustard, Crime, Deterrence, and Right-to-Carry Concealed Handguns, 26 J. Legal Stud. 1 (1997), table 3, are included in the analyses, except that the lagged dependent variable is specific to the proportion of total, nonfirearm, and firearm homicides involving known, stranger, and unknown/missing victim-offender relationships, whereas Lott and Mustard used the total lagged murder rate for all analyses. In addition, all regressions use weighting, where the weighting is each county's population.

in the proportion of victims in the older age groups compared to the younger groups, which was also consistent with Lott and Mustard's examination of the state-level total homicide age distribution.

Finally, Table 5 summarizes the results of the regression analyses after examining the changes in the distribution of the victim-offender relationships as a result of the law across total and firearm homicides. As can be seen, there was a slight, nonstatistically significant increase in the proportion of total homicide victim-offender relationships accounted for by known acquaintances (model 14) and the proportion of total homicides accounted for by unknown/missing relationship (model 16) and a statistically significant decrease in the proportion of total homicides accounted for by situations in which the victim and offender were strangers (model 15). This pattern is consistent with Lott and Mustard's consideration of victim-offender relationships across total homicides at the state level. When we examined the distribution of victim-offender relationships specifically for firearm murders, the right-to-carry law was found to have had an even more pronounced effect. Specifically, the right-to-carry law was associated with a 3 percentage point increase in the proportion of gun homicide offenders known to the victim (model 17) and a 4 percentage point decrease in the proportion of gun homicides involving a victim and offender who were strangers to one another (model 18). This would appear to support the possibility of victim substitution

as described above and as offered by Lott and Mustard. Again, what changed as a result of the law was the proportion of gun homicide victims-offenders within these different categories, not the actual number or rate. No significant changes in the distribution of victim-offender relationships across nonfirearm homicides were found (not presented in tabular form).

V. Conclusions and Implications

The preceding analyses, which sought to replicate Lott and Mustard's original work using a different data source, produced a number of substantive findings. Importantly, the disaggregation of homicides by weapon type (firearm versus nonfirearm) produced dramatically different results than did Lott and Mustard's analyses. Although we also found that firearm homicides decreased, and to a greater extent than did Lott and Mustard, our results indicate that there was an increase in nonfirearm homicides. When combined, both our assessment and the original one performed by Lott and Mustard indicate that the law is associated with a decrease in total homicides, although the magnitude of the effects differed. It is likely that many of these differences between the two studies are due to the different sources of information used. We used SHR data exclusively, whereas Lott and Mustard used a combination of UCR and Mortality Detail Records data. Thus, while both analyses would tend to indicate that there is indeed some smoke, further examination needs to be performed to ensure that there is actually a fire. In addition, the finding that the disaggregation of homicides by weapon type produced different results may also indicate that the right-to-carry law would produce different results in firearm versus nonfirearm assaults, rapes, or robberies and possibly different outcomes of these offenses.

From a theoretical perspective, the finding that the right-to-carry law was associated with an increase in nonfirearm homicides is interesting. During the late 1960s, a "weapons effect" hypothesis was proposed by two experimental psychologists,[50] wherein "the sight of a weapon could trigger aggression from angered persons, due to a learned association between weapons and aggressive behavior."[51] An alternative hypothesis, given the direction of the effect of the right-to-carry law on nonfirearm homicides, is that in those jurisdictions that have implemented right-to-carry laws, individuals who are involved in a spontaneous altercation may respond as though the other person is carrying a concealed handgun and be triggered into a more lethal attack. Thus, the passage of right-to-carry laws may reduce premeditated firearm attacks, or at least cause people to avoid those whom they think or know

[50] Leonard Berkowitz & Anthony LePage, Weapons as Aggression-Eliciting Stimuli, 7 J. Personality & Soc. Psychol. 202 (1967).

[51] As summarized in Kleck, *supra* note 4, at 222.

carry a concealed weapon, but cause unplanned altercations to escalate to lethal outcomes.

Our findings also illustrate the importance of disaggregating data at the jurisdictional level. Although Lott and Mustard recognized and identified the problems of using state-level SHR aggregations to assess the impact of the law on victim characteristics, our findings regarding the gender distribution of victim-offender characteristics when we disaggregated by weapon type and used county-level data were quite different from those reached by Lott and Mustard. Specifically, our county-level analyses indicated that females did not benefit as much from the right-to-carry laws as did males. Similarly, differences in the distribution of victim-offender relationships attributable to the right-to-carry laws were evident when the data were disaggregated by weapon type and jurisdiction (county versus state aggregation). In fact, our results tend to provide even greater support than Lott and Mustard to the theoretical victim substitution effect associated with the right-to-carry law.

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